

PATENT ABSTRACTS OF JAPAN

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(54) SURFACE-TREATED LAMINAR COMPOUND

(57)Abstract:

PROBLEM TO BE SOLVED: To obtain a surface-treated laminar compound which is useful as a reinforcing material or a modifier for a polyester resin, or a polyamide resin, in a uniformly and finely dispersed state, has isotropically reinforcing effect on the resins, and is inhibiting warpage, and excellently promoting crystallization.

SOLUTION: This surface-treated laminar compound is treated with a polyether compound. The polyether compound satisfies at least one condition of (a) containing a cyclic hydrocarbon group and (b) having ≤ 30 mg KOH/g hydroxyl number.

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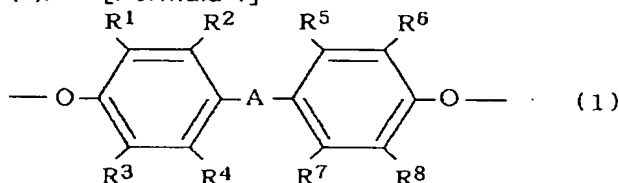
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CLAIMS

[Claim(s)]

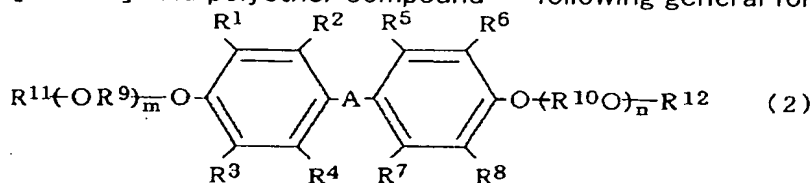
[Claim 1] that are the stratified compound processed with the polyether compound, and said polyether compound has (a) cyclic-hydrocarbon radical, and the (b) hydroxyl value -- 30 or less mgKOH/g and ** -- the surface treatment stratified compound which fulfills the conditions of inside 1 [at least].

[Claim 2] said polyether compound -- the inside of a principal chain -- following general formula (1): -- [Formula 1]



inside of formula, and -A- - O-, -S-, -SO-, -SO₂-, and -CO- They are the alkylene group of carbon numbers 1-20, or the alkylidene radical of carbon numbers 6-20. R¹, R², R³, R⁴, R⁵, R⁶, R⁷, and R⁸ all are the univalent hydrocarbon groups of a hydrogen atom, a halogen atom, or carbon numbers 1-5, and even if they are the same respectively, they may differ. The surface treatment stratified compound according to claim 1 which has the unit expressed.

[Claim 3] said polyether compound -- following general formula (2): -- [Formula 2]



inside of formula, and -A- - O-, -S-, -SO-, -SO₂-, and -CO- They are the alkylene group of carbon numbers 1-20, or the alkylidene radical of carbon numbers 6-20. R¹, R², R³, R⁴, R⁵, R⁶, R⁷, and R⁸ All are the univalent hydrocarbon groups of a hydrogen atom, a halogen atom, or carbon numbers 1-5. Each of R⁹ and R¹⁰ is the divalent hydrocarbon groups of carbon numbers 1-5, each of R¹¹ and R¹² is a hydrogen atom and the univalent hydrocarbon group of carbon numbers 1-20, and even if they are the same respectively, they may differ. m and n show the repeat number of unit of an oxy-alkylene unit, and are 2 ≤ m+n ≤ 50. Surface treatment stratified compound according to claim 1 expressed.

[Claim 4] The surface treatment stratified compound according to claim 1, 2, or 3 which is what is obtained by mixing a stratified compound and a polyether compound in the polar solvent with which the stratified compound processed with said polyether compound contains water or water.

[Claim 5] The surface treatment stratified compound according to claim 1, 2, 3, or 4 whose stratified compound is a stratified silicate.

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DETAILED DESCRIPTION

[Detailed Description of the Invention]

[0001]

[Field of the Invention] This invention relates to the surface treatment stratified compound processed with the polyether compound.

[0002]

[Description of the Prior Art] Stratified compounds, such as talc and mica, are the purposes which improve physical characteristics, such as the rigidity of polyester resin, polyamide resin, etc., a mechanical property, and heat-resistant deformants, and are widely used as a bulking agent or a reinforcing agent. Generally the effectiveness is said to be uniformly effective so that micro-disperse carried out. Also in the stratified compound, about the bloating tendency stratified compound, cleavage of the layer is made easy to carry out, and the technique (JP-9-118518A) which considers as the technique which make it easy to micro-disperse-ize, intercalates high molecular compounds (INTAKARANTO polymer), such as a polyvinyl pyrrolidone, between the layers of a stratified compound, and is made into an intercalation compound is especially indicated. However, said invention of effectiveness is inadequate for carrying out micro-disperse of the bloating tendency stratified compound to polyester, polyamide resin, etc., and an improvement was desired by it.

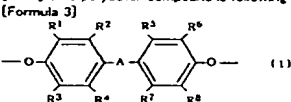
[0003]

[Problem(s) to be Solved by the Invention] This invention solves said technical problem and is to offer the surface treatment more nearly stratified [than the conventional stratified compound] as reinforcing materials and reforming material, such as polyester resin and polyamide resin, compound in which micro-disperse is possible.

[0004]

[Means for Solving the Problem] namely, that this invention is the stratified compound processed with the polyether compound, and said polyether compound has (a) cyclic-hydrocarbon radical and the (b) hydroxyl value ≥ 30 or less mgKOH/g and $m+n \geq 2$ is related with the surface treatment stratified compound which fulfills the conditions of inside 1 [at least].

[0005] Said polyether compound is following general formula (1): [0006] in a principal chain.



[0007] inside of formula, and -A- - O-, -S-, -SO-, -SO₂-, and -CO- They are the alkylene group of carbon numbers 1-20, or the alkylidene radical of carbon numbers 6-20. R¹, R², R³, R⁴, R⁵, R⁶, R⁷, and R⁸ all are the univalent hydrocarbon groups of a hydrogen atom, a halogen atom, or carbon numbers 1-5, and even if they are the same respectively, they may differ. It is desirable to have the unit expressed.

[0008] Said polyether compound is following general formula (2): [0009].

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mold TENIO light, a lithium mold 4 silicon mica, and a sodium mold 4 silicon mica, or such mixture are raised. The bottom spacing in the state of aggregation in early stages of said bloating tendency mica is 10-17Å about, and the mean particle diameter of the bloating tendency mica in a state of aggregation is about 1000-1 millionÅ.

[0017] There are some said bloating tendency micas which have the structure similar to vermiculites, and such a vermiculite equivalent etc. can be used. There are 3 octahedron molds and 2 octahedron molds in this vermiculite equivalent, and it is the following general formula (5): (Mg, Fe, aluminum) Two to 3 (Si₄-xAl_x)O₁₀ (OH) 2 and (M⁺, M²⁺1/2) x - nH₂O (5)

What is expressed with (the inside of a formula and M are alkali, such as Na and Mg, or the convertibility cation of alkaline earth metal, $\alpha = 0.6$ to 0.9, and $n=3.5-5$) is raised. The bottom spacing in the state of aggregation in early stages of said vermiculite equivalent is 10-17Å about, and the mean particle diameter in a state of aggregation is about 1000-5 millionÅ.

[0018] Although what has whenever [which was regularly piled up in the direction of a c-axis / pure / high] is desirable as for the crystal structure of a stratified silicate, the so-called mixed layer mineral with which turbulence and two or more sorts of crystal structures were mixed by the crystal period may also be used.

[0019] A stratified silicate may be used independently, and it may be used, combining it two or more sorts.

[0020] Among the above and a stratified compound, the bloating tendency mica which has sodium ion between a montmorillonite, a bentonite, hectorite, and a layer is desirable from the point of the dispersibility in the inside of the strengthening polyester resin constituent obtained, and the physical-properties improvement effect of a strengthening polyester resin constituent.

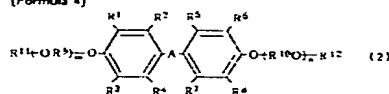
[0021] Said polyether compound fulfills the conditions of at least 1 among having (a) cyclic-hydrocarbon radical and the (b) hydroxyl value being 30 or less mgKOH/g. If said one of conditions are fulfilled, micro-disperse of the stratified compound can be carried out to homogeneity. Moreover, said polyether compound is not limited especially as long as the conditions of [1 / at least] said conditions are fulfilled. For example, the compound whose principal chains are polyoxyethylene, such as a polyoxyethylene and a polyoxyethylene-polyoxypropylene copolymer, is raised, and that whose repeat number of unit is two to about 100 is raised.

[0022] With the polyether compound which has said cyclic-hydrocarbon radical, the object which has a cyclic-hydrocarbon radical in the side chain of polyoxyethylene compounds, such as a polyoxyethylene and a polyoxyethylene-polyoxypropylene copolymer, and/or a principal chain is meant. Specifically, the polyethylene glycol which contains the bisphenol A unit in a principal chain, the polypropylene glycol which contains the bisphenol A unit in a principal chain are raised. It is in the inclination whose micro-disperse effectiveness to polyester resin improves because said polyether compound has a cyclic-hydrocarbon radical. Moreover, thermal stability also improves. Said cyclic-hydrocarbon radical means an aromatic hydrocarbon radical and/or an aliphatic hydrocarbon radical, for example, a phenyl group, a naphthyl group, a cycloalkyl radical, etc. are raised. In this specification, especially when calling it a "phenyl group", as long as there are no directions, it means including the cyclic-hydrocarbon radical of many π , such as a "phenylene group." A naphthyl group and a cycloalkyl radical include a naphthylene radical, a cyclo alkylene group, etc. similarly, respectively. In a cyclic-hydrocarbon radical, an aromatic hydrocarbon radical is desirable from the point of thermal stability and the dispersibility of a stratified compound.

[0023] Moreover, as a polyether compound whose hydroxyl value is 30 or less mgKOH/g, the polyethylene glycol which carried out end closure is raised with an alkoxy group etc. 28 or less mgKOH/g of 25 or less mgKOH/g of 23 or less mgKOH/g of hydroxyl values of said polyether compound is 20 or less mgKOH/g especially preferably still more preferably more preferably preferably. If a hydroxyl value is larger than 30 mgKOH/g, the molecular weight of thermoplastic polyester resin will fall and the reinforcement and the toughness of a resin constituent will fall as a result.

[0024] Especially the measuring method of said hydroxyl value is not limited, but can perform the approach of arbitration. For example, 1g of polyether compounds used by this invention is

[Formula 4]



[0010] inside of formula, and -A- - O-, -S-, -SO-, -SO₂-, and -CO- They are the alkylene group of carbon numbers 1-20, or the alkylidene radical of carbon numbers 6-20. R¹, R², R³, R⁴, R⁵, R⁶, R⁷, and R⁸ all are the univalent hydrocarbon groups of a hydrogen atom, a halogen atom, or carbon numbers 1-5. Each of R⁹ and R¹⁰ is the divalent hydrocarbon groups of carbon numbers 1-5, each of R¹¹ and R¹² is a hydrogen atom and the univalent hydrocarbon group of carbon numbers 1-20, and even if they are the same respectively, they may differ. m and n show the repeat number of unit of an oxy-alkylene unit, and are 2 (<m+n<50). Being expressed is desirable.

[0011] It is desirable that the stratified compound processed with said polyether compound is what is obtained by mixing a stratified compound and a polyether compound in the polar solvent containing water or water.

[0012] It is desirable that said stratified compound is a stratified silicate.

[0013]

[Embodiment of the Invention] The stratified compound used by this invention is one or more sorts chosen from the group which consists of niobates, such as molybdate, such as vanadates, such as uranates, such as tungstates, such as titanates, such as phosphates, such as a silicate and a phosphoric-acid zirconium, and potassium titanate, and sodium tungstate, and uranic acid sodium, and a vanadium acid potassium, and molybdic-acid magnesium, and a niobic acid potassium, and a graphite. A stratified silicate is preferably used from points, such as the ease of acquisition, and handling nature, especially.

[0014] With said stratified silicate, it is formed mainly from the octahedron sheet of a metal hydroxide with the tetrahedron sheet of silicon oxide, for example, smectite group clay, a bloating tendency mica, etc. are mainly raised.

[0015] Said smectite group clay is the following general formula (3): X10.2-0.6Y12 - 3214Q10 (OH)2 and nH₂O (3)

(X1 is one or more sorts chosen from K, Na, 1/2calcium, and the group that consists of 1/2Mg among a formula, Y1 is one or more sorts chosen from the group which consists of Mg, Fe, Mn, nickel, Zn, Li, aluminum, and Cr, and Z1 is one or more sorts chosen from the group which consists of Si and aluminum.) in addition — although H₂O expresses the water molecule combined with the ion between layers — n — the ion between layers, and relative humidity — responding — remarkable — changing — the nature expressed — or it is compounded. As an example of this smectite group clay, these substitution products or derivatives, such as a montmorillonite, beidelite, nontronite, saponite, iron saponite, hectorite, a saucorite, a SUCHIBUN site, and a bentonite, or such mixture are raised, for example. The bottom spacing in the state of aggregation in early stages of said smectite group clay is about 10-17Å, and the mean particle diameter of the smectite group clay in a state of aggregation is 1000A - 1 millionA about.

[0016] Moreover, said bloating tendency mica is the following general formula (4): X20.5-1.0Y22-3(Z24010) (F, OH) 2 (4)

(— X2 is one or more sorts chosen from the group which consists of Li, Na, K, Rb, calcium, Ba, and Sr among a formula, Y2 is one or more sorts chosen from the group which consists of Mg, Fe, nickel, Mn, aluminum, and Li, and Z2 is one or more sorts chosen from the group which consists of Si, germanium, aluminum, Fe, and B.) — the nature expressed — or it is compounded. These are objects which have the property to swell in the mixed solvent of water, water, the polar solvent that dissolves at a rate of arbitration, and a water and this polar solvent, for example, these substitution products or derivatives, such as a lithium mold TENIO light, a sodium

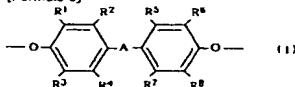
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acetylated with an acetyl chloride, an acetic anhydride, a glacial acetic acid, etc. subsequently, mg of the potassium hydroxide taken to neutralize the acetic acid which hydrolyzed namely, saponifies with alkali compounds, such as a sodium hydroxide, and is produced by it — let a number be a hydroxyl value.

[0025] In said polyether compound, it is following general formula (1): [0026] in a principal chain.

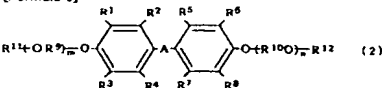
[Formula 5]



[0027] inside of formula, and -A- - O-, -S-, -SO-, -SO₂-, and -CO- They are the alkylene group of carbon numbers 1-20, or the alkylidene radical of carbon numbers 6-20. R¹, R², R³, R⁴, R⁵, R⁶, R⁷, and R⁸ all are the univalent hydrocarbon groups of a hydrogen atom, a halogen atom, or carbon numbers 1-5, and even if they are the same respectively, they may differ. The polyether compound which has the unit expressed may be preferably used from the point of thermal stability and the dispersibility of a stratified compound. Aforementioned -A- has -C(CH₃)₂- and desirable -CH₂- from the point that acquisition is easy. Moreover, as for said R¹, R², R³, R⁴, R⁵, R⁶, R⁷, and R⁸, it is desirable that it is the radical chosen from a hydrogen atom, a methyl group, and an ethyl group, respectively from the point that acquisition is easy.

[0028] Furthermore, the following general formula (2): [0029]

[Formula 6]



[0030] inside of formula, and -A- - O-, -S-, -SO-, -SO₂-, and -CO- They are the alkylene group of carbon numbers 1-20, or the alkylidene radical of carbon numbers 6-20. R¹, R², R³, R⁴, R⁵, R⁶, R⁷, and R⁸ all are the univalent hydrocarbon groups of a hydrogen atom, a halogen atom, or carbon numbers 1-5. Each of R⁹ and R¹⁰ is the divalent hydrocarbon groups of carbon numbers 1-5, each of R¹¹ and R¹² is a hydrogen atom and the univalent hydrocarbon group of carbon numbers 1-20, and even if they are the same respectively, they may differ. m and n show the repeat number of unit of an oxy-alkylene unit, and are 2 (<m+n<50). The polyether compound expressed may be especially used preferably from the point of thermal stability, the dispersibility of a stratified compound, and the ease of acquisition. Aforementioned -A- has -C(CH₃)₂- and desirable -CH₂- from the point that acquisition is easy. Moreover, as for said R¹, R², R³, R⁴, R⁵, R⁶, R⁷, and R⁸, it is desirable that it is the radical chosen from a hydrogen atom, a methyl group, and an ethyl group, respectively from the point that acquisition is easy. As for said R⁹ and R¹⁰, it is desirable that they are ethylene and/or a propylene radical from the point that acquisition is easy. As for said R¹¹ and R¹², it is desirable that it is the radical chosen from a hydrogen atom, a methyl group, and an ethyl group from the point that acquisition is easy. As for said m+n, it is desirable that it is 2 (<m+n<50, m+n is 2 (<m+n<30 more preferably. When m+n is smaller than 2, it is in the inclination for the dispersibility of the stratified compound in the inside of resin to be spoiled. When m+n surpasses 50, it is in the inclination for the stability over heat to fall. Moreover, as for said m, it is desirable that it is 1-15 from the point of the point that acquisition is easy, the dispersibility of a stratified compound, and thermal stability. As for said n, it is desirable that it is 1-15 from the point of the point that acquisition is easy, the dispersibility of a stratified compound, and thermal stability.

[0031] To said polyether compound, unless it has a bad influence on thermoplastic polyester resin or a stratified compound, you may have functional groups other than functional groups

resin C-2 is called viscosity 0.82 (dl/g) and the following)

Polyamide 6 (resin C-3 is called Amilan CM 1026 of Toray Industries, Inc., degrees C [25], the relative viscosity 3.0 measured in 98% concentrated sulfuric acid, and the following)
 Polyacetal (resin C-4 is called hereafter for melt index 9.0g measured by Duracon M50-44 of Polyplastics, 190 degrees C of conditions, and 2.16g of loads / 10 minutes)
 - The glass fiber by fibrous reinforcement Nippon Electric Glass Co., Ltd. (the fibrous reinforcement B-1 are called T-195H and the following)
 Moreover, the evaluation approach in an example and the example of a comparison is shown collectively below.

[0050] (Bottom spacing) The bottom spacing of a surface treatment stratified compound was measured using the X-ray generator (the Rigaku Corp. make, RU-200B) by the Measuring condition (target CuK alpha rays, nickel filter, the electrical potential difference of 40kV, 200mA of currents, scan angle 2theta=0.2-15.0 degree, and step angle =0.02 degree).

[0051] The bottom spacing computed the small-angle-X-ray-diffraction peak angle value by having assigned it to the formula of Bragg. However, when the check of a coniculus X-ray peak angle value was difficult, the layer fully carried out cleavage, and crystallinity disappeared substantially, or since a peak angle value was 0.8 degrees or less about, it considered that a check was difficult, and could be >100Å as an evaluation result of a bottom spacing.

[0052] (FT-IR) After fully mixing about 1mg surface treatment compound and about 200mg KBr powder using a mortar, the KBr disk for measurement was produced using the desk press. Subsequently, it measured with the transmission method using infrared spectrograph (the Shimadzu Corp. make, 8100M). Resolution made 4cm⁻¹ and the count of a scan 100 times using the MCT detector which cooled the detector by liquid nitrogen.

[0053] (Rate of ash content) JIS K It measured according to 7052.

[0054] (Measurement of a distributed condition) The resin constituent ultrathin section with a thickness of 50-100 micrometers was used. Observation photography of the distributed condition of reinforcing materials, such as a stratified compound, was carried out by one 40,000 to 1 million times the scale factor of this with the acceleration voltage of 80kV using the transmission electron microscope (JEOL JEM-1200EX). In the TEM photograph, the field of arbitration where 100 or more particulate materials exist was chosen, and the number of particulate materials ([N] value) was measured. [N] Mean carrying out micro-disperse, so that a value is large. [N] Measurement of a value was performed by [as being the following]. First, it asks for the particle number of the stratified compound which exists in the selected field on a TEM image. Apart from this, the rate of ash content of the resin constituent originating in a stratified compound is measured by said approach. Said particle number was $\pi \times (cd)$ at said rate of ash content, and the value converted into 2 an area of 100 micrometers was made into the [N] value. The particulate material was large, and when observation by TEM was unsuitable, the [N] value was calculated by the same approach as the above using the optical microscope (optical microscope BM-2 made from Olympus Optics). However, if needed, melting of the sample was carried out at 250-270 degrees C using the hot stage THM500 made from LINKAM, and it measured the condition of a particulate material with the melting condition.

[0055] (Curvature) After drying a resin constituent, injection molding of the plate-like test piece with a dimension of about 120x120x1mm was carried out on conditions with a die temperature [of 120 degrees C], and a resin temperature of 250-280 degrees C. The aforementioned plate-like test piece was placed on the flat surface, one in four corners of a test piece was pressed down, and the distance from a flat surface measured the largest value among remainder 3 corners using slide calipers. Each four corner was pressed down and the average of the acquired curvature value was calculated.

[0056] (Bending property) After drying a resin constituent, injection molding of the test piece of dimension [of about 120mm] x 120mm x 3mm thickness was carried out with the resin temperature of 250-270 degrees C using the injection molding machine of 80t of clamping pressure. The test piece of dimension [of about 12.7mm] x 120mm x 3mm thickness is cut out from the obtained mold goods in the direction of MD, and the direction of TD, and it is ASTM. The bending elastic modulus was measured according to D-790. It excels, so that a value is

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表 2		実例				比較例			
試験C-1	試験C-2	重量部	1	2	3	4	5	6	7
			100	100	100	100	100	100	100
表面処理層状化合物M-2	重量部	12							
ガラス繊維	重量部			10					
ガラス繊維	重量部				10				
成分率	wt%	8.9	0	9.8	9.8				
分散粒子径[N]		82	0	5	1				
曲げ弾性率 MD	MPa	5680	2980	3490	5840				
曲げ弾性率 TD	MPa	5660	3010	3510	3650				
反り	mm	1.2	変形	1.2	25				

[0064] From Table 2, since micro-disperse of the surface treatment stratified compound of this invention is carried out to homogeneity into resin, it has the effectiveness which controls the reinforcement effectiveness and curvature. The system which blended talc on the other hand has the inadequate reinforcement effectiveness. Moreover, it turned out that it has an anisotropy although the system which blended the glass fiber has the reinforcement effectiveness, curvature is large and a problem is in a dimension.

[0065] The next experiment was conducted in order to show the effectiveness of an example 6 surface-treatment stratified compound. That is, by the weight ratio shown in Table 3, the package injection of resin and the surface treatment stratified compound of this invention was carried out at the biaxial extruder (TEX44, product made from Japanese-made Steel), melting kneading was carried out, and the resin constituent was obtained. The crystallization temperature and the degree of crystallinity at the time of the temperature up of the obtained resin constituent and a temperature fall were evaluated. [0066] which shows a result in Table 3 By carrying out melting kneading of four to example of comparison 5 resin C-1, and the talc using a twin screw extruder, the resin constituent was obtained and it was similarly estimated as the example 6. A result is shown in Table 3.

[0067]

(Table 3)

表 3		実例				比較例			
試験C-1	試験C-2	重量部	4	5	6	7	8	9	10
			100	100	100	100	100	100	100
表面処理層状化合物M-2	重量部	4							
ガラス繊維	重量部			4					
成分率	wt%	2.3	0.9	3.9					
分散粒子径[N]		86	0	4					
昇温時結晶化温度	℃	208	189	195					
降溫時結晶化温度	℃	103	145	134					
結晶化度	%	38.6	25.6	33.9					

[0068] Table 3 shows that the crystallization rate and degree of crystallinity of resin increase, when micro-disperse of the surface treatment stratified compound of this invention is carried out. Thereby, a moldability improves.

[0069] The next experiment was conducted in order to show the effectiveness of the surface treatment stratified compound of six to examples 7-9 and example of comparison 8 this invention. That is, melting kneading of the surface treatment stratified compound or talc of resin and this invention was carried out by the weight ratio shown in Table 4, and the constituent was obtained. The bending elastic modulus and curvature of MD of the obtained constituent and the direction of TD were evaluated. A result is shown in Table 4.

[0070]

large, and there is no anisotropy, so that the value of MD and TD is near.

[0057] (Crystallization temperature, degree of crystallinity) It measured by part for 10 degrees-C of rising and falling temperature using DSC220C made from SEIKO Electron.

[0058] Stirring mixing of an example 1-4 ion exchange water, and the stratified compound was carried out for 5 minutes with the wet-mill machine (a colloid mill, the NIPPON SEKI CO., LTD. make, a rotational frequency 3000-5000rpm, shear rates 2000-3000 (1-/s)), and it considered as the slurry. Subsequently, it added, and it mixed for 15-30 minutes, and the polyester compound was processed. After it, it dried, it fine-particles-sized by grinding, and the surface treatment stratified compound (M-1 to M-4) of this invention processed with the polyester compound was obtained. The weight ratio of the used raw material is shown in Table 1. The bottom spacing of the obtained surface treatment stratified compound and the surface functional group were evaluated. In accordance with a result, it is shown in Table 1.

[0059]

(Table 1)

表 1		実例			
表面処理層状化合物	重量部	1	2	3	4
		M-1	M-2	M-3	M-4
イオン交換水	重量部	100	100	100	100
層状化合物A-1	重量部	5			
層状化合物A-2	重量部		10	10	10
ポリエーテル化合物B-1	重量部	3	2	5	
ポリエーテル化合物B-2	重量部				5
表面処理	重量部	23	24	35	23
成分分析結果		エーテル結合、ベンゼン環、水酸基、ナフタレン基	エーテル結合、ベンゼン環、水酸基、ナフタレン基	エーテル結合、ベンゼン環、水酸基、ナフタレン基	エーテル結合、ベンゼン環、水酸基、ナフタレン基

[0060] As shown in Table 1, the polyether compound exists in the front face of a stratified compound, and the bottom spacing is expanded by it. Therefore, it turns out that the surface treatment stratified compound of this invention is obtained.

[0061] The next experiment was conducted in order to show the effectiveness of an example 5 surface-treatment stratified compound. That is, by the weight ratio shown in Table 2, the package injection of resin and the surface treatment stratified compound of this invention was carried out at the biaxial extruder (TEX44, product made from Japanese-made Steel), melting kneading was carried out, and the resin constituent was obtained. The bending elastic modulus and curvature of MD of the obtained resin constituent and the direction of TD were evaluated. A result is shown in Table 2.

[0062] The resin constituent was obtained and evaluated by carrying out melting kneading of one to example of comparison 3 resin C-1, a glass fiber, and the talc using a twin screw extruder (the product made from Japanese-made Steel, TEX44). A result is shown in Table 2.

[0063]

(Table 2)

http://www4.ipd.ncipi.go.jp/cgi-bin/tran_web.cgi.cgi

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(Table 4)

表 4		実例				比較例			
試験C-2	試験C-3	重量部	7	8	9	10	11	12	13
			100	100	100	100	100	100	100
表面処理層状化合物M-2	重量部	12			12				
表面処理層状化合物M-3	重量部			15					
ガラス繊維	重量部				10	10	10		
成分率	wt%	8.9	8.7	8.9	9.8	9.7	9.7		
分散粒子径[N]		80	72	78	4	4	4		
曲げ弾性率 MD	MPa	5340	5120	4880	3040	2990	2840		
曲げ弾性率 TD	MPa	5330	5090	4850	3050	3040	2860		
反り	mm	1.5	2.1	2.2	2.5	5.1	5.9		

[0071] It turns out that micro-disperse of the surface treatment stratified compound is carried out to homogeneity, the reinforcement effectiveness as the result is acquired, and curvature is also controlled also in other various resin from Table 4.

[0072]

[Effect of the Invention] As explained in full detail above, a surface treatment stratified compound is obtained by mixing in a solvent the polyether compound and stratified compound which have specific structure. If the obtained surface treatment stratified compound is blended with polyester resin, polyamide resin, etc., micro-disperse of it will be carried out to homogeneity in resin. Consequently, as the isotropic reinforcement effectiveness and the depressor effect of curvature, and another effectiveness, it has a crystallization facilitatory effect etc. The resin constituent obtained may be used for various applications.

[Translation done.]